Plant Document Analysis

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ENGINEERING SPECIFICATION ANALYSIS

Focus Area: Nozzle Load Analysis

Generated on November 18, 2025

ScopeNozzle Load Analysis (extracting only items present in the supplied tank specification and indicating what the spec requires for nozzle-load work, plus a concise reminder of the industry standard method referenced in the document).

Section 1: Accepted Specifications for Evaluation of Nozzle Load Analysis

• The document requires nozzle loads to be evaluated per API 650 (referenced throughout) and specifically includes an Appendix P (Allowable External Loads on Tank Shell Openings) as mandatory for design when external piping loads are specified.

• Appendix P (P.1.1) requires the CONTRACTOR to provide calculations justifying the acceptability of the specified external nozzle and support pad loading.

• Appendix P: The tabulated nozzle allowable external loads (apply at the nozzle-to-shell junction) are given for nominal nozzle sizes; these tabulated values are part of the specification and are accepted criteria for evaluating nozzle loads.

• The document states that nozzle loads larger than those in the table may be specified by the CONSTRUCTION MANAGER and that the CONTRACTOR must confirm acceptability or advise maximum acceptable loading.

• Vendor Data Requirement (12.2.viii) explicitly requires submission of "Nozzle load Analysis" as part of vendor data during manufacturing & site erection.

• Appendix P: Loadings shown apply at the nozzle-to-shell junction (explicit statement in the spec).

• Addition: Reinforcement or bearing plates shall be added to the tank bottom under all concentrated loads (explicit requirement to provide local reinforcement under concentrated loads — relevant when nozzle loads impose concentrated forces/moments at shell).

• (Addition): Minimum distance from bottom of tank to centre line of any nozzle or manway shall be as per API Standard 650 table 5.6a (document requires nozzle elevations to comply with API 650 table 5.6a).

• Appendix P: For nozzle sizes greater than 24" NB, loadings are to be agreed between CONTRACTOR and CONSTRUCTION MANAGER (explicit contractual requirement for larger nozzle loads to be negotiated).

Section 2: Measurements Provided in Document

• Appendix P nozzle allowable external loads table (values apply at nozzle-to-shell junction):

• " and below: Loads are considered negligible (no numeric values).

• " NB: Radial load = 1,000 N; Circumferential moment = 200 N·m; Longitudinal moment = 200 N·m.

• " NB: Radial load = 1,500 N; Circumferential moment = 300 N·m; Longitudinal moment = 300 N·m.

• " NB: Radial load = 2,500 N; Circumferential moment = 700 N·m; Longitudinal moment = 700 N·m.

• " NB: Radial load = 4,000 N; Circumferential moment = 1,500 N·m; Longitudinal moment = 1,500 N·m.

• " NB: Radial load = 5,000 N; Circumferential moment = 2,500 N·m; Longitudinal moment = 2,500 N·m.

• " NB: Radial load = 7,000 N; Circumferential moment = 4,000 N·m; Longitudinal moment = 4,000 N·m.

• " NB: Radial load = 9,000 N; Circumferential moment = 6,000 N·m; Longitudinal moment = 6,000 N·m.

• " NB: Radial load = 11,000 N; Circumferential moment = 8,000 N·m; Longitudinal moment = 8,000 N·m.

• " NB: Radial load = 13,000 N; Circumferential moment = 10,000 N·m; Longitudinal moment = 10,000 N·m.

• " NB: Radial load = 15,000 N; Circumferential moment = 13,000 N·m; Longitudinal moment = 13,000 N·m.

• " NB: Radial load = 20,000 N; Circumferential moment = 18,000 N·m; Longitudinal moment = 18,000 N·m.

• Appendix P: Explicit statement that the tabulated loadings apply at the nozzle-to-shell junction (measurement location).

Section 3: Inputs and Additional Requirements from Client (explicit in the document)

• Explicit vendor data required: "Nozzle load Analysis" must be submitted during Manufacturing & site erection (12.2.viii).

• CONTRACTOR responsibility: Confirm acceptability of specified external nozzle and support pad loading or advise maximum loading acceptable for the tank design (Appendix P).

• If nozzle loads > 24" NB are required, the CONTRACTOR and CONSTRUCTION MANAGER must agree on loadings (Appendix P).

• The CONSTRUCTION MANAGER may specify nozzle/piping loadings higher than those in Appendix P; CONTRACTOR must verify or advise (Appendix P).

• The document requires nozzle elevations to comply with API 650 table 5.6a (5.7.6.4); therefore the tank data sheets must provide nozzle centerline elevations per API 650.

• Reinforcement requirement: Specification requires reinforcement or bearing plates under all concentrated loads such as support legs for floating roofs, heating coils, etc. (5.8.2 Addition) — explicit requirement that CONTRACTOR provide local reinforcement where concentrated loads occur.

• The document does not list the actual nozzle-by-nozzle external loads for the specific tank(s); it provides allowable limits (Appendix P) but not the applied loads from connected piping. The CONTRACTOR/vendor must supply the actual external radial forces and moments to be checked against the table (document explicitly requires submission of nozzle load analysis).

• The document does not provide nozzle locations (circumferential/vertical coordinates) for specific tanks in this specification text — nozzle elevations must be as per API 650 table 5.6a but the actual elevation values per nozzle are in the tank data sheets (the spec states that tank data sheets contain specific requirements).

• The document does not provide support-pad details, local reinforcement geometry, or pad allowable reactions for each nozzle — CONTRACTOR must specify and/or justify.

• For nozzles >24" NB, specific agreed loads are not provided (document requires agreement between CONTRACTOR and CONSTRUCTION MANAGER).

• The specification references API 650 (including Appendix P) as the standard for allowable external loads on shell openings. Appendix P provides nominal radial loads and moments by nozzle nominal size to be used as minimum criteria and requires the manufacturer to provide calculations to demonstrate acceptability of specified piping loads or to advise maximum acceptable loads. The supplied table in Appendix P is the document's required baseline for nozzle load checks.

Notes / limits

• I listed only items explicitly present in the supplied document (including the Appendix P table and text statements). I did not infer application-specific nozzle loads, piping reactions, or perform any calculations — those are required from the CONTRACTOR as per the

specification (vendor data requirement 12.2.viii).

• If you want, I can next:

• Identify the exact data fields that the vendor's "Nozzle load Analysis" submittal should contain (based on the document's requirements and API 650 Appendix P), or

• Produce a checklist for the vendor submittal (e.g., nozzle ID, size, location, applied radial/axial/shear/moments, pad/plate detail, justification vs table values, attachments).

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